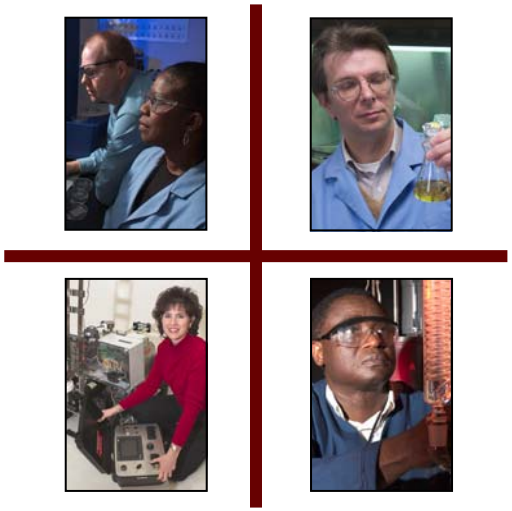
Simulants to Support RPP-WTP and SRS



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Simulant Development Philosophy

- Planned application of the Simulant drives the Simulant Development
- Waste Simulants shall duplicate the chemistry of actual Waste
  - Tank Farm Chemistry
  - Chemistry during Melter Feed Preparation requires Validation
- Duplication of the physical properties of actual waste is desirable or required

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RPP-WTP LAW Simulants

- Chemical Simulants
  - AN-102, AN-107, AN-105
  - Match chemical composition, density, viscosity
  - Requires good analytical characterization data
- Physical Simulants
  - Low Bound LAW, High Bound LAW
  - Match Bounding rheology limits
  - Developed to support Agitator design/tests
  - Desirable to match waste composition if possible

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Issues During WTP LAW Simulants Development at SRS

- Difficult to produce an undiluted chemical LAW simulant
  - Target is generally a saturated supernate
  - Potential for temperature and crystallization issues
- Premature development of a simulant before characterization information is finalized
- Scale up issues
  - Precipitation due to trace impurities (Reagent Grade versus Commercial Grade)
  - Substitution of alternate raw materials
  - Sequence of addition steps
- Stability Issues
  - Carbonate increase due to CO2 absorption
  - Chemical reactions between simulant and glass formers

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RPP-WTP HLW Simulants

- Precipitated AZ101 Simulated Sludge
  - Complete chemical simulant
  - Physical Properties Targeted were rheology, density
  - First simulant prep to include thermal aging step
- AY-102/C-106 Simulant
  - Chemical simulant for both sludge and supernate
  - Targeted properties included Al leaching, rheology, density
- HLW Bounding Physical Simulants
  - Sludge was based on simple industrial oxides/hydroxides
  - Physical Properties Targeted were rheology, solids loading

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Issues During WTP HLW Simulants Development at SRS

- Availability of appropriate materials for both types of sludge simulants
- Particle Size versus shear for precipitation processes can produce scaling issues when moving from lab (Liter) to pilot (100+ gallons)
- Stability issues
  - Potential for chemical reactions between simulant and glass formers
  - Physical properties versus time were not studied

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SRS HLW Simulants to Support DWPF

- SRS sludge simulants based on precipitation
  - DWPF macro batch, specific tanks or waste types
  - Target composition and chemistry then if possible physical properties
- SRS sludge simulant issues
  - Thermal aging less effective at modifying sludge rheology
  - Scale up issues have been observed when producing larger quantities
    - Impact of mixing (shear) during precipitation
    - Temperature
  - Currently testing sludge simulant precipitation in Continuously Stirred Reactor (CSTR)
    - Fixed geometry gives controlled shear, residence time and temperature

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Simulant Development Summary

- Simulant application controls simulant development
- Analytical characterization accuracy is vital for chemical simulants
- Stability of simulants over time should be considered
- Scale up issues (one liter to hundreds of gallons)

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